Formulating Aboriginal Criteria and Indicator Frameworks

Marie–Christine Adam and Daniel Kneeshaw

THE SUSTAINABLE FOREST MANAGEMENT NETWORK

Established in 1995, the Sustainable Forest Management Network (SFM Network) is an incorporated, non-profit research organization based at the University of Alberta in Edmonton, Alberta, Canada.

The SFM Network's mission is to:
• Deliver an internationally-recognized, interdisciplinary program that undertakes relevant university-based research;
• Develop networks of researchers, industry, government, Aboriginal, and non-government organization partners;
• Offer innovative approaches to knowledge transfer; and
• Train scientists and advanced practitioners to meet the challenges of natural resource management.

The SFM Network receives about 60% of its $7 million annual budget from the Networks of Centres of Excellence (NCE) Program, a Canadian initiative sponsored by the NSERC, SSHRC, and CIHR research granting councils. Other funding partners include the University of Alberta, governments, forest industries, Aboriginal groups, non-governmental organizations, and the BIOCAP Canada Foundation (through the Sustainable Forest Management Network/BIOCAP Canada Foundation Joint Venture Agreement).

KNOWLEDGE EXCHANGE AND TECHNOLOGY EXTENSION PROGRAM

The SFM Network completed approximately 334 research projects from 1995 – 2008. These projects enhanced the knowledge and understanding of many aspects of the boreal forest ecosystem, provided unique training opportunities for both graduate and undergraduate students and established a network of partnerships across Canada between researchers, government, forest companies and Aboriginal communities.

The SFM Network's research program was designed to contribute to the transition of the forestry sector from sustained yield forestry to sustainable forest management. Two key elements in this transition include:
• Development of strategies and tools to promote ecological, economic and social sustainability, and
• Transfer of knowledge and technology to inform policy makers and affect forest management practices.

In order to accomplish this transfer of knowledge, the research completed by the Network must be provided to the Network Partners in a variety of forms. The KETE Program is developing a series of tools to facilitate knowledge transfer to their Partners. The Partners' needs are highly variable, ranging from differences in institutional arrangements or corporate philosophies to the capacity to interpret and implement highly technical information. An assortment of strategies and tools is required to facilitate the exchange of information across scales and to a variety of audiences.

The KETE documents represent one element of the knowledge transfer process, and attempt to synthesize research results, from research conducted by the Network and elsewhere in Canada, into a SFM systems approach to assist foresters, planners and biologists with the development of alternative approaches to forest management planning and operational practices.

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Abstract

Adapting forest management strategies for Aboriginal cultures, needs and objectives has been challenging. The C&I process has been a popular tool used to conceptualize, evaluate and implement sustainable forest management globally and has recently been used with Aboriginal communities. To date however impressions among Aboriginal communities and organizations are dominated by a feeling that Aboriginal values and objectives are being minimized.

Through a literature review and case studies, this report investigates whether the dissatisfaction of Aboriginal communities with the C&I process is due to a lack of understanding by decision-makers and thus incorporation of Aboriginal values or the methods used to access them. It also determines whether the process of C&I is appropriate to Aboriginal communities by determining the conceptual challenges which may be faced when integrating scientific and Aboriginal worldviews. When the contents of Aboriginal and non-Aboriginal local/regional frameworks are compared, five recommendations can be made to improve the integration of Aboriginal values. These recommendations largely relate to differences pertaining to the cultural needs expressed in the Aboriginal indicators and the need to emphasize relationships between criterion rather than strict hierarchical categories.

Regardless of these recommendations for improvement, it is generally agreed that C&I are a valid platform to discuss social values with scientific knowledge of environmental conditions. A review of the methodology used to elaborate C&I frameworks in Canadian case studies highlights:

1) the importance of participation methods and the influence of community context on their effectiveness, and

2) the differences in the objectives of using top-down versus bottom-up approaches to C&I.

This review also introduces the potential for a hybrid approach between top-down and bottom-up approaches to enable the C&I process to collect local information for C&I such that they can be compared and integrated at all scales of management. Finally, case study examples and a review of the literature are used to evaluate the conceptual challenges of using the C&I process in Aboriginal communities. They stress the importance of recognizing the existence of different worldviews in order to achieve a dialogue which should lead to collaboration. In this report, the benefits of this collaboration are compared to those of social learning. It is in this light that further recommendations are made to improve the C&I process:

1) learning and evidence of learning by all involved parties needs to occur; and

2) efforts towards the sharing of power between worldviews is noted as an important step to create a learning environment which can promote true collaboration, reflection and innovative responses.

The report concludes with a discussion of the issues regarding the implementation of Aboriginal C&I to achieve sustainable forest management with Aboriginal values and objectives.

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1.0 Introduction

Achieving sustainable use of forest resources is a challenge. Balancing and optimising social, economic and environmental values while ensuring their heritage for future generations has become the primary objective of many development efforts. Society and social values are therefore an important part of this equation. However, difficulties have occurred in trying to include those most dependent on forest resources and thus most affected by forest development issues. More specifically, inclusion of Aboriginal interests in forestry has been especially problematic. Their inclusion requires the interpretation of Aboriginal culture and values which can be a difficult process as they are influenced among other thing by the effects of differing sets of social and environmental contexts. The development of forest management strategies that are well adapted to indigenous people's values, objectives and social realities is thus one of the current challenges of forestry in Canada.

More specifically in Canada, Aboriginal interests have been recognised as an important component of forest sustainability because:

1. Many Aboriginal communities live on or near productive forest areas. In Canada, 80% of First Nation communities are located in the productive regions of the boreal and temperate forests (Smith 2004). The effects of forestry operations near or on traditional lands will impact these communities.

2. Aboriginal people are an essential element of sustainable forest management (SFM) in Canada (Smith 1998). Aboriginal peoples can contribute to SFM as a result of their forest practices, traditional knowledge and the unique relationship they hold with the land (Gladu and Watkinson 2004). As mentioned in Natcher and Hickey (2002), this has been recognised in important Canadian proceedings:

    > The involvement of indigenous peoples in the management process is being recognized as both an unrelinquished right (e.g., Report of the Royal Commission of Aboriginal Peoples in Canada 1997), as well as a necessary factor in achieving sustainable environments (e.g., Brundtland 1987)….

3. Inclusion of Aboriginal peoples in resource use is a constitutional right. Under the National Forest Strategy (2003-8), the government is required to "accommodate Aboriginal and treaty rights in the sustainable use of the forest recognizing the historical and legal position of Aboriginal Peoples and their fundamental connection to ecosystems" (National Forest Strategy Coalition 2003).

Various initiatives exist to include Aboriginal interests in the development of forest resources. Some initiatives focus on providing opportunities which would benefit the social context of Aboriginal communities by sharing forest development

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interests. Other initiatives seek to include Aboriginal peoples in the evaluation of the sustainability of forest management processes such that Aboriginal interests as defined by their values and objectives are included. For example, some initiatives have tried to create benefit sharing opportunities with Aboriginal communities in forest management by investigating economic partnerships and co-management agreements (Wyatt 2008; Hickey and Nelson 2005). Also, opportunities have been created by focusing on Aboriginal rights issues (Ross and Smith 2002). Evaluation of sustainability on Aboriginal terms has been attempted by characterising Aboriginal land use patterns through traditional land use and occupation studies (Natcher 2001; Robinson and Ross 1997). Some initiatives have focused on consultation strategies to access Aboriginal values and objectives in the decision making processes (Côte and Bouthillier 2002; Yamasaki *et al.* 2001). One approach, which has been used and has gained in popularity since the 1990s, is that of criteria and indicators (C&I).

The purpose of this report is to specifically address criteria and indicators as a tool used to include Aboriginal interests in forest management. In this report:

1. C&I will be described as a tool and how they have included Aboriginal interests.

2. Aboriginal and non-Aboriginal C&I will be compared to evaluate the understanding of Aboriginal ecological interests. Identifying similarities and differences between C&I selected by Aboriginals versus non-Aboriginals helps clarify our understanding of the goals the frameworks seek to portray.

3. Methods used to include Aboriginal interests in C&I will be reviewed. How Aboriginal values and objectives have been used to create a C&I framework and the issues of using a top-down versus bottom-up strategy will be discussed. The advantages and disadvantages of methods used to involve Aboriginal communities in forest management will also be explored.

4. The conceptual challenges of using the C&I process in Aboriginal communities will be reviewed.

5. Finally, the management implications of using C&I to include Aboriginal interests in SFM will be investigated.

This report will review existing Canadian C&I for Aboriginal communities, discuss the methods used to develop them and assess whether the C&I are appropriate to Aboriginal forest interests. Not all initiatives aimed at including Aboriginal forest interests in the development of forest resources have been effective. Although the goal is to include Aboriginal communities in forest management, persistent failure has resulted in the feeling that there is a lack of commitment to achieve it. What is it about these efforts that prevent the effective translation of identified Aboriginal interests to their inclusion in management? Is the problem in understanding Aboriginal interests or the methods used to define them?
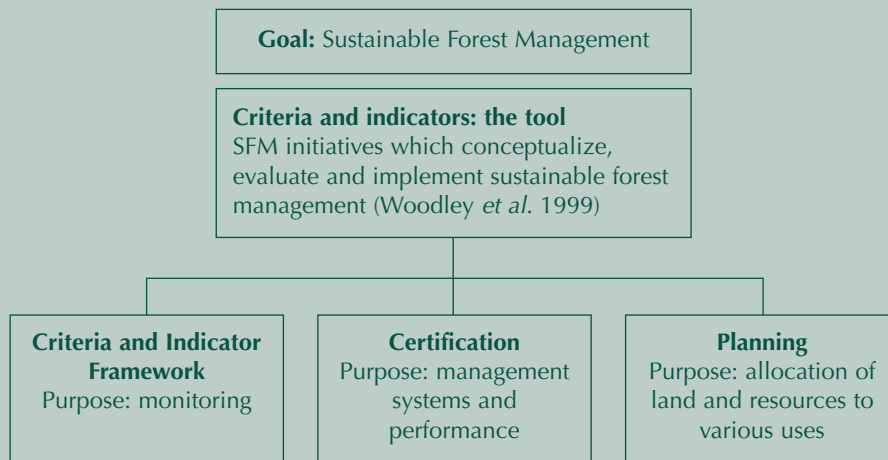
1.1 Criteria and Indicators as a strategy

C&I are tools used to conceptualize, evaluate and implement sustainable forest management (SFM) (Woodley *et al.* 1999). There is international agreement amongst C&I frameworks. They are one of the most popular tools used to define and assess SFM as more than 150 countries have developed C&I sets or approaches (Holvoet and Muys 2004; Castañeda 2000). These initiatives came out of the Statement of Forest Principles agreed to at UNCED in 1992 (United Nation Conference on Environment and Development, Rio de Janeiro, Brazil, June 13, 1992). Many comparisons have been made between sets of C&I and have demonstrated that besides expected differences attributed to scale and geography (Holvoet and Muys 2004), there is growing consistency in defining C&I for SFM. For example, in a comparison using C&I from the International Tropical Timber Organisation (ITTO), the European Union (EU) and the Montreal Process (MP), sufficiently specific and agreed principles and C&I were found which could guide policy-makers towards SFM (McDonald and Lane 2004). According to McDonald and Lane (2004), there is substantial conformity between the philosophy and intent, scope and content of C&I while differences merely reflect the contexts within which C&I were developed. Therefore as a tool, C&I approaches are considered to be well developed (Holvoet and Muys 2004; Innes *et al.* 2004). It is in this light that C&I have become a valuable source and tool to be used for the inclusion of Aboriginal interests.

Criteria and Indicator (C&I) Terminology

As mentioned by Innes *et al*. (2004) much of the terminology referring to Sustainable Forest Management (SFM) initiatives are used inconsistently and different terms are used synonymously from one initiative to the next. The following figure tries to generalise trends in this terminology.

> **Goal:** Sustainable Forest Management

> **Criteria and indicators: the tool**
> SFM initiatives which conceptualize, evaluate and implement sustainable forest management (Woodley *et al.* 1999)

Criteria and Indicator Framework	**Certification**	**Planning**
Purpose: monitoring	Purpose: management systems and performance	Purpose: allocation of land and resources to various uses

It is important to note that C&I can be used for different objectives. The objective of C&I can either be to provide information on the state of the forest under management as done with national and local framework initiatives; or to provide guidelines for management systems as done by certification efforts (Neimann and Innes 2004). They can therefore take the form of trends or standards which will be used to implement SFM.

Criteria and Indicator (C&I) Terminology (continued)

Each management initiative organises sustainability issues into a hierarchical format with its component parts defining its respective emphasis (ie. monitoring, management systems and performance). The hierarchy will vary between a three dimensional framework at minimum to a multi-dimensional framework with five to nine levels. These levels are defined in the following table:

Available SFM framework levels, their general definitions and notes on their comparability and presence in SFM initiatives.		
Framework levels	**General definition**	**Notes on levels**
Principle	Fundamental rules for action	Usually the base-line for most frameworks. It is in effect a separation of sustainability issues into ecological, social and economic categories.
Criteria	Desired conditions resulting from adherence to principles (Innes *et al.* 2004), a category of conditions or processes by which sustainable forest management (CCFM) may be assessed	Across frameworks these two levels (Criteria and Principles) can easily be compared as one level.
Element	A subset of indicators that can be grouped within a criteria	
Indicators, standards	Has been defined as a parameter, scientific factor or variable to assess a criterion	The number of framework levels following the indicator level will depend on its definition as a variable or factor and parameter. Both factor and parameter indicators need further definition and thus more levels.
Critical local values	The spectrum of values and priorities community members associate with the forest (Sherry *et al.* 2005)	These two levels are more usually found in frameworks designed for smaller scales such as regional and local scales. However, the goal may be integrated at the indicator level by specifically mentioning desired trends and values in its formulation.
Goals	The desired trends (maintenance, protection, restoration, decrease, increase)	
Measures	Define the characteristics to monitor (Wright *et al.* 2002)	
Norms, Reference values, Benchmarks, Target values, Thresholds	Comparisons against which the data may be evaluated (Wright *et al.* 2002)	The use of these levels will depend on the SFM initiative either to monitor, implement or conceptualise SFM.
Verifiers, Data element	The specific information collected for each measure (Wright *et al.* 2002)	
Actions/strategies	Define the methods to use	This level is useful in the application of the SFM initiative at the local level.

Criteria and Indicator (C&I) Terminology (continued)

In general the number of levels attributed to the SFM initiative will depend on: 1) the definition assigned to indicators; 2) the target management unit; and 3) the role of SFM initiatives. More specifically, indicators defined as processes and parameters require more levels to define the quantitative or qualitative measures needed to assess sustainability. Furthermore, the need for measures is dependent on the scale at which the initiative will be applied.

At the national scale, definition of these measures is left to the discretion of the framework user. The national initiatives deal with trends which require further definition should they be applied in a specific region. At the local scale, frameworks are devised to answer specific sustainability issues for which measures will generally be assigned. Finally, the different SFM initiatives require different levels of flexibility in their frameworks. Certification, for example, provides standards which need to be met. As such, verifiers, target levels and goals are expected in the design of the framework. On the other hand C&I used to monitor management focus on performance trends and as such target values will be omitted from the frameworks while benchmarks and reference values should be present.

Many efforts have been made to ensure appropriate use of C&I at the local level, with national scale C&I often serving as foundations for the development of C&I sets at the local level. For example, Canadian Council of Forest Ministers (CCFM) C&Is were used by the model forest network to develop 10 local C&I sets (Canadian Model Forest Network 2000). More recently, local and regional C&I application efforts have also attempted to characterise and include local Aboriginal interests (Saint-Arnaud *et al.* 2005; Sherry *et al.* 2005; Natcher *et al.* 2002). Although both national and local C&I sets have undergone rigorous research and expertise in their development, they have had little revision. A review of the methods used to develop C&I as well as their effectiveness in including Aboriginal interests, is therefore necessary.

1.2   C&I: effective inclusion of Aboriginal interests?

In Canada, the C&I sets developed at the national and local scale have had varying results in their effective inclusion of Aboriginal interests. Although it has been established that C&I are a well developed tool, it has also been recognised that further work is required to include Aboriginal forest values and objectives (Parrotta and Agnoletti 2007; Natcher *et al.* 2005; Smith 2004). For example in the CCFM C&I set (Canadian Council of Forest Ministers 1995), a suggestion by the National Aboriginal Forestry Association (NAFA) and the Aboriginal community at large to include a seventh criterion specific to Aboriginal interests has been repeatedly rejected. Reference to Aboriginal elements in the CCFM's Criterion 6, Accepting Society's Responsibility, which recognizes treaty rights, traditional land use and forest based ecological knowledge is not sufficient to accommodate Aboriginal values and objectives in SFM. The general impression among Aboriginal communities and organisations such as NAFA is that the importance of Aboriginal issues has been minimized (Smith 2004).

Canadian C&I sets have had varying results in their effective inclusion of Aboriginal interests

2.0 Inclusion of Aboriginal interests in C&I frameworks

2.1 State of the research on Aboriginal interests and C&I

There is a shift in approaches used to incorporate Aboriginal interests, from increasing participation efforts to defining Aboriginal forest perspectives through values and objectives

Research efforts are showing a shift in approaches used to incorporate Aboriginal interests, from increasing participation efforts such as consultation, to defining Aboriginal forest perspectives through values and objectives. This shift is occurring because, without an understanding of how Aboriginal people perceive benefits from the forest by including their values and objectives, translating consultation and participation processes into information available for managers will remain problematic. Holistic patterns of Aboriginal-forest relationships are difficult to translate into the more hierarchical system of frameworks found in science and management (Parrotta and Agnoletti 2007). Many Aboriginal communities do not separate society from individual, culture from nature, nor society from environment (Davidson-Hunt and Berkes 2003). The socio-ecological dynamics found within Aboriginal cultures are not easily reduced to sets of criteria and indicators. There needs to be emphasis on understanding Aboriginal values and objectives before attempting to increase their participation in management processes (Stevenson and Webb 2003).

Although C&I offer a hierarchical framework to represent social, environmental and economic issues, they have been used as a tool to define Aboriginal forest perspectives. When applied at the local level, the development and selection of C&I can stimulate Aboriginal communities to express and represent values and objectives pertaining to their relationship with the forest.

There are few examples which include Aboriginal values and goals in C&I and forest management. As of 2003, only 286 out of 610 Aboriginal communities in Canada had management plans, of which only a few include social values (138), cultural values (104), or spiritual values (40) (Smith 2004). The case studies presented in this report only represent a small fraction of the work which needs to be done and further action is required to include Aboriginal communities in SFM initiatives.

Natcher *et al.* (2002) developed a local level C&I framework for the Little Red River community in Alberta to "articulate value diversity, transparent to both community members and resource managers and would follow for ongoing learning, adjustment and improvement in the management process". Karjala *et al.* (2003) developed an Aboriginal Forest Planning Process (AFPP) with the Tl'azt'en Aboriginal community to:

1. incorporate Aboriginal land values into local forest management plans in a proactive way;

2. improve communication between Aboriginal and non-Aboriginal land user groups; and

3. raise non-Aboriginal land users' awareness about, and appreciation for, Aboriginal land values.

Saint-Arnaud *et al.* (2005) used the intercultural dialogue generated by the process of criteria and indicators to define forestry strategies which respect Aboriginal values. Finally, the Waswanipi Cree Model Forest project used C&I to develop Cree standards for SFM. The model forest is viewed as: "a vehicle for cultural demonstration of environmental stewardship approaches; requiring Aboriginal perspectives to be prominent in all forestry programs and operation" (Natural Resources Canada 2002).

Although there are few examples which compare C&I developed for specific Aboriginal communities, each has led to valuable results exposing the complexities of representing Aboriginal values and objectives. Sherry *et al.* (2005) published a comparison of an Aboriginal C&I framework set up for the Tl'azt'en community with national and international scale C&I frameworks to determine the effective incorporation of Aboriginal concerns. Their general conclusions about the applicability of national and international C&I frameworks to Aboriginal values and objectives included that:

1. C&I focused on environmental processes are the most compatible across all frameworks,

2. There is a need to further develop Aboriginal C&I pertaining to process, economic sustainability and to incorporate cultural values, and

3. When compared to top-down national and international frameworks, those developed using a bottom-up process increased the Aboriginal relevance of C&I.

Common Aboriginal issues which need further C&I development have been identified through research. These include: economic opportunities, economic diversity, youth issues, and traditional land use patterns (Ettenger *et al.* 2002; Beckley 2000). Gladu and Watkinson (2004) compared Aboriginally defined C&I from local level frameworks and found 17 common Aboriginal indicators dominated by the following Aboriginal concerns: treaty rights, knowledge, resource use, land ownership, protection, traditional activities, economic opportunities, continued and monitored participation, education, compensation and health issues.

2.2   Comparing local Aboriginal C&I and non-Aboriginal C&I

Previous comparisons of Aboriginal C&I have highlighted common concerns among Aboriginal communities at the local level. They also raised some issues and exposed a divide between C&I sets derived from bottom-up versus top-down approaches. Such comparisons are frustrated by issues of scale and motive. So how do Aboriginal and non-Aboriginal C&I compare at the local level? This section addresses this question by comparing the previously mentioned case

studies with the local and regional non-Aboriginal frameworks from Woodley *et al.* (1999) (the North American Test of Criteria and Indicators of sustainable forestry framework (NATCI)) and from the FSC certification (2004) (Forest Stewardship Council (FSC) Canada Working Group National Boreal Standard).

It should be noted that FSC and NATCI originate from two different SFM C&I initiatives described earlier. FSC is used for certification purposes while NATCI is a C&I framework used for monitoring purposes. Based on NAFA concerns for CCFM and the fact that NATCI originates from CCFM, it was believed that differences would be overestimated if the comparison was limited to this framework. FSC on the other hand is the most Aboriginally accepted SFM initiative and comparisons may underestimate differences with Aboriginal C&I. Therefore both were used for this comparison with the hopes of averaging out Aboriginal and non-Aboriginal C&I differences.

In order to move beyond a case study approach, the contents of C&I frameworks should be compared but such comparisons are faced with many limitations:

1. each framework hierarchy is different and has different goals including monitoring and certification;

2. the selection of indicators for each framework serves to answer a select number of issues and thus not all frameworks are complete in terms of sustainability issues; and

3. not all frameworks are at the same stage of development and some may be more optimal than others in dealing with certain sustainability issues.

As a result of these shortcomings, caution is advised when analysing results. However, these comparisons are useful to formulate questions and identify information gaps.

In order to sort through the limitations of comparing C&I framework contents, the distribution of indicators across frameworks and sustainability issues was observed. The presence of indicators within sustainability issues indicates that the community has either considered the issue or has been approached to reflect upon the issue. On the other hand, a lack of indicators shows a gap in the information and suggests that further research is required. The number of indicators within a sustainability issue indicates a level of complexity and raises many questions. For example, is an increased number of indicators in one criteria due to an increased number of components which need to be considered, or does it reflect a lack of optimisation in the framework? If the increased number of indicators is due to an increased number of components to be dealt with, then it may be more useful for managers to look at management "hot topics".

One can also ask whether an increased number of indicators reflects the challenge of translating sustainability issues to indicators and thus whether efforts have been made in aggregating issues? However, some criteria may be so complex

that selecting appropriate indicators may be difficult. In such a case, the lack of indicators justifies a need for further research on the issue. Where this complexity lies and where it is omitted is worth studying as it can serve to advance research, identify information gaps, as well as identify potential areas of frustration that are important to communities but difficult to quantify.

This report focuses on ecological indicators because:

- According to Sherry *et al.* (2005) C&I have largely focused on environmental processes which render issues regarding ecological sustainability more comparable across frameworks,

- Aboriginal organizations such as NAFA have explicitly requested increased inclusion of Aboriginal environmental values, and

- Aboriginal communities live in and are part of the environment and as such, culture and other social values emanate from, and are embedded in their relationship with the environment.

Table 1 shows the distribution of indicators across frameworks. The distribution of ecological and non-ecological indicators in proportion with total framework indicators deserves attention. More specifically, in non-Aboriginal local level frameworks half of the total indicators are ecological indicators. Ecological indicators only contribute 13-20% of Aboriginal frameworks. This raises the following questions:

1. Are Aboriginal socioeconomic issues in SFM management hot topics, or do these indicators need to be optimised in the frameworks? If the proportion of indicators reflects concern levels and hot topics, this would support previous conclusions for increased development of Aboriginal socioeconomic sustainability issues in C&I found by Sherry *et al.* (2005), Ettenger *et al.* (2002) and Beckley (2000).

2. Are all ecological sustainability issues addressed by Aboriginal C&I frameworks? Adam and Kneeshaw (2008) analysed the distribution of ecological indicators in detail. They found that the distribution of indicators in the criteria for the maintenance of the physical environment, the maintenance of genetic diversity and incidence of disturbance and stress did not lend itself to comparisons between C&I sets. Some Aboriginal frameworks included indicators in these categories while others didn't. This could indicate: a gap of information; that either further understanding or avenues to express these issues is required; an impression that these values were globally covered by other indicators in Aboriginal C&I frameworks; or a need to put emphasis on more encompassing or culturally important indicators. Further research is required to address and understand these issues.

Table 1 demonstrates that a total of 13 different Aboriginal ecological indicators were extracted when all Aboriginal frameworks were compiled. Do these 13 ecological indicators render Aboriginal C&I frameworks truly different from non-Aboriginal frameworks? Before approaching this question it should be determined whether and how Aboriginal C&I frameworks should be different. Because of the differences in values and objectives between Aboriginal and non-Aboriginal communities, differences in the expression of C&I are expected. However, it can be argued that these differences may originate more from the organisation of indicators within the framework than solely from the indicators themselves.

Table 1.   Distribution of indicators used for comparison by framework. The grey area represents non-Aboriginal frameworks.

	Amalgamation of C&I appropriate for the North American test	FSC boreal standard	Waswanipi Cree Model Forest	Tl'azt'en C&I, AFPP	Little Red River Cree Nation (LRRCN)****
# indicators (critical values)/ framework	57	201	125	143	30
# ecological indicators/ framework	20	102	19	20	6
# ecological indicators used*/ framework	20	65	26	23	7
# ecological indicators used but different / 13**	0	4***	10	7	6

*   the ecological indicators used are those referring to the ecological themes found in Adam and Kneeshaw (2008)
**   A total of 13 indicators were identified in Aboriginal frameworks which are not covered or only partially covered in non-Aboriginal frameworks
***   These were only partially covered in this non-Aboriginal framework
****   Based on the sustainability matrix

Various methods can be used to assess a criterion and different indicators can be used for the same ultimate purpose. Determining indicators to measure a healthy forest for example, will be influenced by the values and the objectives of those defining a healthy forest. In the Anicinapek community of Kitcisakik, a healthy forest is one which is considered both as "dark" (or primeval) and as "good food storage" for the community. At first glance, such statements suggest that the identification and availability of specific species may be used as indicators of forest health. On the other hand, from a forester's perspective, a healthy forest could be determined based on long-term wood production. Therefore although the ultimate goal of maintaining a healthy forest is stated as being the same, different values and objectives influence the way in which criteria may be described.

Similarly, the same indicator can be used to assess various criteria. Indicators reflecting issues of high value for a community will often be found in many criteria. For example, important game species have the tendency to be incorporated in many criteria (conservation, ecosystem health and economic sustainability). Aboriginal forest values and objectives therefore influence the organisation of environmental issues in C&I frameworks which may lead to differences with non-Aboriginal frameworks.

The influences of values and objectives on the determination of C&I for environmental issues will also be strongly affected by geography. It is therefore difficult to predict how one Aboriginal community versus another will organise C&I. When one observes only the indicators as shown in Table 1, the number of different indicators present is variable amongst and between Aboriginal and non-Aboriginal frameworks. Within Aboriginal frameworks, not all different Aboriginal indicators were included in each (e.g., the Waswanipi Cree model forest included 10 of the 13 different ecological indicators within the 26 ecological indicators used for comparison). More specifically, the different indicators make up between 30 and 85% of the ecological indicators in Aboriginal frameworks. Because of their varied presence within Aboriginal frameworks, and the fact that FSC partly includes 4 of the 13 different indicators, it is difficult to assess which non-Aboriginal framework is more different than the grouped Aboriginal frameworks.

In this context, it may be that Aboriginal frameworks are as different from one another as they are from non-Aboriginal frameworks. If this is indeed true then an approach evaluating only case studies could be defended. However, if differences between communities are among priorities and expression of C&I whereas differences with non-Aboriginal frameworks are systematically similar then comparison is useful. Further investigation as to the nature of the differences in indicators between/among frameworks is thus necessary since differences may be related more to local environmental experiences than to differing viewpoints. In their review, Adam and Kneeshaw (2008) noted that different indicators in Aboriginal frameworks had the following common themes:

1. ecological indicators with cultural importance (e.g. hunting, trapping, protection of Aki);

2. aesthetic concern for forest operations which affect those practicing Aboriginal land use activities; and

3. increased complexity of indicators regarding access to resources where sustainability of productivity, proximity, integrity and quality of resources used in Aboriginal land use activities was introduced.

Briefly, the authors found that although ecological C&I appear compatible when comparing issues of forest conditions (fragmentation, populations, biodiversity, etc.) there was a recurring need to integrate cultural components with forest conditions in local Aboriginal frameworks. These recurring cultural components

Further investigation of the differences in indicators between/among frameworks is necessary since differences may be related more to local environmental experiences than to differing viewpoints

point towards some similarities in values between Aboriginal communities. It is therefore perhaps the influences of place and community objectives which render Aboriginal C&I different from one another, especially at the indicator level. As such, a case study approach is an important step to understand Aboriginal interests.

Aboriginal culture emphasizes relationships (see Berkes (2008) for more details), while there is a tendency for science to focus on components (Cheveau *et al.* 2008; Stevenson 2006). This has led to some difficulties evident in the development of C&I for Aboriginal interests. For example, there is a tendency in C&I development to categorize cultural issues such as trapping in the social principle or with regards to its economic implications. From an Aboriginal perspective, although trapping is strongly affected by the distribution and abundance of the species, it is also affected by the health of the forest and how productive the environment is in providing the expected experience for the trapper (remoteness and aesthetics). As explained by Stevenson (2006) trapping is not limited to wildlife but involves a relationship between the individual, the land, the animal and the activity itself. As such isolating C&I into strict categories and hierarchies is not applicable to Aboriginal values and objectives where the relationship to land is closely tied to culture, tradition and subsistence methods (Adam and Kneeshaw 2008; Berkes 2008).

It is therefore recommended that to improve C&I for Aboriginal values and objectives:

1. Further understanding of Aboriginal socioeconomic issues in SFM is necessary,

2. Further integration of ecological C&I to include Aboriginal cultural values and objectives is required,

3. Further development of ecological C&I to include Aboriginal indicators in the criteria for the maintenance of the physical environment, the maintenance of genetic diversity and incidence of disturbance and stress is needed,

4. Concerted efforts must be made at- and between all scale levels (global, national, regional and local) such that Aboriginal C&I and the issues they encompass can be discussed jointly. This would allow a degree of comparability of Aboriginal C&I from one scale or region to the next while respecting the distinct objectives of each community, and

5. C&I categorisation and hierarchy needs to be expanded and less isolated such that Aboriginal forest values and objectives which emphasize the relationships between humans and environments can be included.

Regardless of the improvements required to gain effective incorporation of Aboriginal values and objectives in C&I development, there is increasing support that C&I are a valid platform to discuss social values with scientific knowledge of environmental conditions (Adam and Kneeshaw 2008; Fraser *et al.* 2006). The local level Aboriginal frameworks which have been developed have allowed increased incorporation and expression of Aboriginal values and objectives in terms which can be used by science and managers (Saint-Arnaud *et al.* 2009). Further incorporation of Aboriginal values and objectives which emphasize relationships between environment and culture could also benefit C&I frameworks which have been criticised in general for their reductionism and long list of unconnected indicators (Natcher and Hickey 2002; Kneeshaw *et al.* 2000; Bunnell and Huggard 1999).

3.0 Including Aboriginal values and objectives in C&I: comparing methods

The previous sections focused on the use and understanding of Aboriginal values and objectives as C&I. It is also important to question whether the methods used to access Aboriginal values and objectives are appropriate and specific to Aboriginal communities. In general, the methods used for the development of C&I can be separated into two parts: participation methods and a bottom-up or top-down approach.

There is a trend in the literature to critique methods used to develop C&I. However, these criticisms do not consider the context for C&I development nor do they differentiate between up or down methods and participation methods. As a result, top-down and bottom-up approaches are often referred to in opposition. It is unclear whether criticisms truly originate from the up or down approach or from the participatory methods used. Karjala *et al.* (2003) and Natcher and Hickey (2002) for example, argue that sustainable management should be determined using bottom–up approaches rather than standardized frameworks. According to these authors, conventional participatory approaches and generic sets of C&I derived from top-down approaches are often inappropriate for engaging Aboriginal involvement and result in the removal of indigenous peoples from decision and policy making processes.

However, it is argued that it is the participation methods used which have the responsibility of engaging Aboriginal involvement. Another important issue is that the effects of context are rarely identified when C&I methods are being critiqued. The Aboriginal community context can strongly influence the methods available for C&I development. Aboriginal communities are not equal in terms of their social conditions and grassroots institutions and this affects the available expertise and the dialog between community and managers. Communities and their individuals differ in their capacity to engage in dialogue on forestry issues and the development of C&I.

There is increasing support that C&I are a valid platform to discuss social values with scientific knowledge of environmental conditions

It is unclear whether criticisms of C&I development originate from the approach or from the participatory methods used

The criticism regarding the methods used to develop C&I can be approached in two ways. The first is to create a dichotomy and definition of each method with their positive and negative effects. The second is to tend towards a hybrid approach between methods. This section reviews and compares up or down approaches and participation methods at the local scale to clarify their advantages and disadvantages in accordance with community contexts.

3.1   Top-down and bottom-up approaches

Creating a dichotomy between a top-down and a bottom-up approach is a difficult task because of the effects of scale and origin. More specifically, each C&I framework is developed to function within specific scales (from local and regional to national levels). It is important to decide and be specific about the scale of application of each C&I framework. In effect, scale defines the scope of application of C&I frameworks. The origin of C&I development relates to who developed them and how C&I were selected and as such relates to the intent of using C&I frameworks. Therefore the scope and intent of using the top-down or bottom-up approach can vary and lead to different sets of C&I. C&I sets can differ in the numbers of C&I, in the organization and themes of principles, in their hierarchical organization, as well as the degree to which values and objectives are incorporated into the frameworks. This section discusses why the determination of which approach is better requires some generalizations be made and suggests that it may not necessarily be beneficial to C&I development in the end.

The methods used to develop C&I frameworks are often differentiated based on the origin or intent for development. More specifically, it has been suggested that top-down approaches are often developed by outside influences while bottom-up approaches are based on local initiatives. In an Aboriginal context, top-down methods are often associated with non-Aboriginal responsibility in C&I development and the idea that external sets of values and goals are imposed on Aboriginal communities. Indeed there are few examples of management plans which effectively include Aboriginal goals and values, however most focus on a few easily identifiable constraints (Smith, 2004). Using methods which describe and translate well to Aboriginal local issues and culture is necessary to ensure Aboriginal interest and collaboration in the C&I process.

To date, there are no Aboriginal top-down approaches. However, should top-down approaches refer to the development of C&I by external sources, it could be argued that all C&I sets would be top-down from an Aboriginal perspective. The initiative originates from non-Aboriginal sources and, by definition, to an external influence. However, the possibilities of developing top-down Aboriginal C&I frameworks is not excluded. An Aboriginally led top-down approach could be used as a means to voice Aboriginal concerns on larger landscape issues and expand the role of Aboriginal peoples beyond local level decision making processes.

The methods used to develop C&I frameworks could also be differentiated based on scale where top-down approaches apply at larger scales (national) and bottom-up at finer scales (local). In this case, top-down approaches are criticised for not accurately portraying the finer issues which are included in local bottom-up approaches. At the same time, bottom-up approaches are criticised for being too local in nature to achieve an aggregation and application of information into frameworks developed at larger scales. In the case of top-down approaches, some national level C&I have been used as a reference and it was found that they did not translate well to local scales for all categories (Kneeshaw *et al.* 2000). Woodley *et al.* (1999) tested CCFM and CIFOR national level C&I frameworks at the forest management unit scale in North America. They found that the tested indicators did not translate well from one scale to the next and thus rejected 65 out of 207 C&I. Furthermore, C&I which were initially developed for national scale issues may not effectively describe nor engage communities in the development of local issues. Woodley *et al.* (1999) suggested that had the selection of C&I started from scratch, results would have been different.

From an Aboriginal point of view, the different values and objectives associated with Aboriginal communities have generally introduced different characterisations of SFM issues which have been difficult to integrate into non-Aboriginal frameworks of management, planning and decision making. These are especially difficult to include in top-down approaches, which have to incorporate many other Aboriginal and non-Aboriginal SFM perspectives. Although bottom-up approaches ensure that the different values and objectives expressed at the local level are well incorporated in the development of C&I, they cannot account for the pluralistic character of Aboriginal values, perceptions and objectives (Adam and Kneeshaw 2008; Natcher and Hickey 2002). A comparative analysis of the characteristics of different top-down C&I (LUCID, CIFOR, CCFM) with the bottom-up approach used in the Tl'azt'en Nation by Sherry *et al.* (2005) also showed these differences. Not only were hierarchical definitions different among top-down C&I frameworks but in terms of social criteria, none clearly identified the importance of community health or well-being – which was identified by the Tl'azt'en Nation as a key element in social sustainability (Sherry *et al.* 2005). Furthermore, issues such as climate change and species at risk, which may fall beyond the boundaries of a single community, and the issues gathered with a bottom-up approach, are more likely be discussed when implementing a top-down approach that is participatory and focuses discussion points in an existing framework.

To assess the value of the top-down versus bottom-up approaches, one needs to question motive. More specifically, is the objective to access the values and objectives of one local community, many local communities or is it to address national issues? Bottom-up approaches tend to have greater focus at the local level, are performed in isolation of regional or national interests, and lack any intent to achieve consensus amongst Aboriginal cultures. These efforts become problematic when there is a need to portray different values, perceptions and objectives existing within and amongst Aboriginal communities (Natcher and Hickey 2002). It can be argued that it is precisely a top-down approach which

Top-down approaches may not accurately portray finer issues and bottom-up approaches may be too local in nature to achieve an aggregation and application of information into frameworks developed at larger scales

facilitates aggregation of local issues into higher scales. However, top-down approaches can be limiting by forcing indicators into defined boxes. This raises the importance of aggregation from one scale to the next. According to Fraser *et al.* (2006), indicators need to be collected at as local a level as possible, and then aggregated using a relatively simple and transparent process. This allows information to be both summarized quickly for policy makers, and unpacked for more careful monitoring and follow-up.

In the Aboriginal context, although a definition of Aboriginal values and goals requires bottom-up efforts, there are also advantages to the top-down approach. For example, despite the absence of local concerns and the use of a hierarchical language in the top-down approach, C&I frameworks that would be applied by many Aboriginal communities and seek national relevance could be of interest. Such observations invite researchers and multiple forest users to create new proposals for forest management that are not only better anchored in local and cultural realities, but also in the perspective of sustainability that is consistent with their vision of the forest. The challenge is in accurately portraying this pluralism and to incorporate it at a higher scale. In effect, this resembles what may be a hybrid approach between the top-down and bottom-up approach. The criteria could be influenced by the top-down approach to ensure the inclusion of certain issues while some indicators could be determined locally. More research is required to effectively develop such a method and to ensure its relevance to Aboriginal communities.

3.2 Participation methods and context: collecting Aboriginal values and objectives at the local scale

There is often a link made between bottom-up or top-down approaches and Aboriginal engagement and collaboration. A higher level of participation and involvement methods for Aboriginal peoples is too often associated with bottom-up approaches. Such an association limits public participation to fine scale issues which is unfair and discouraging. In reality, participation can occur at all scales and the degree to which certain participation methods are effective varies as much at the local as at the national scale. For example, the identification of C&I in a local level initiative may have been imposed by interview questions pertaining to large scale issues. These large scale issues may not warrant local participation or interest in C&I development. Therefore if criticisms are based on seeking the most effective methods to engage Aboriginal communities, the participation methods used to engage the community should be investigated rather than the approach employed.

Participation methods used in the development of C&I have received very little attention in the literature yet they require the most investment in terms of time and human resources. Various participation methods have been used to access community values and objectives for SFM. These range from the use of archives, community reports, consultation with community experts and stakeholders in forest related issues, to extensive individual and family interviews. It should be noted that this section presents participation and engagement of Aboriginal peoples as a means to access their values and objectives. In reality, the

A hybrid approach is where the criteria are influenced by the top-down approach to ensure the inclusion of certain issues while some indicators are determined locally using the bottom-up approach

In seeking the most effective methods to engage Aboriginal communities, the participation methods used to engage the community should be investigated rather than the approach employed

participation and engagement of all parties involved in C&I development is important for collaboration and learning purposes. This is discussed in the next section. Table 2 describes different case studies and the variety of participation methods used as well as a brief description of the community context when C&I were developed. A number of points can be drawn from these studies.

Participation method depends on the initial level of community activity and capacity in forest related issues. Various indicators can be used to describe a community which is active in forest related issues such as the presence of formal or informal grassroots institutions involved and knowledgeable with forestry issues. The presence and involvement of these institutions in forest related

Table 2.   A description of the case studies used based on scale, up or down approach and participation method. Names in parentheses in the first column are of the person who wrote up the indicators.

	Up or down approach	Scale	Participation methods	Context – first evidence of studies and contact on forestry related issues
Waswanipi Cree Model Forest	top-down	Local	Consultation process with a development team composed of both Aboriginal and non-Aboriginal members to develop guidelines to improve Cree participation in forest management planning process. This was preceded by 2-year activities with problem setting, direction setting and structuring activities to determine the composition and process of the development team.	Population 12,000. 1998 court action by Cree tallymen and chiefs against federal and provincial governments and 27 forestry companies which had been active on their land for the last 25 years.
Kitcisakik (Asselin)	top-down	Local	Consultation process with Aboriginal forest committee.	Population 400. 2001 collaboration with university researchers to discuss forestry issues. Publication in 2004 on territorial and resource exploitation in Kitcisakik.
Kitcisakik (Saint-Arnaud)	bottom-up	Local	Consultation process with Aboriginal forest committee. Interviews/education initiatives to define community relationship with the forest and forestry. Scenario planning approach.	

Table 2 (continued).

	Up or down approach	Scale	Participation methods	Context – first evidence of studies and contact on forestry related issues
Tl'azt'en C&I, AFPP	bottom-up	Local	Generating scenarios based on Tl'azt'en values, and using forest planning models to simulate various management alternatives. Uses existing archived information (traditional use studies, community based and other research projects, journal article, interviews and photographs) to identify community values. Consultation process with community leaders, elders and interest parties and an advisory group.	Population 640. Archival data demonstrates that the community has been contacted for research on land use and occupancy, oral history, traditional knowledge, community well being and the impacts of forest development since 1965. Since 1998 they have their own department of natural resources which administers forest, fisheries and traditional use programmes.
Little Red River Cree Nation (LRRCN)	bottom-up	Local	Based on natural and social science research projects, technical reports, oral histories and map biographies. A joint university and community team oversaw the research. Interviews and open-response surveys asking: what is it about this area that you value? What needs to be maintained or protected for you to retain your relationship with the land? And what needs fixing or improving upon for the community to be healthy socially, culturally, economically and environmentally? Using participatory action research, community driven research design.	Population 2,500. 1991 the community entered in dialogue with the federal and provincial government to ensure their constitutional rights to lands and resources. Also the community established research partnerships with Sustainable Forest Management Network (SFMN) since 1996 which have accumulated more than 20 research projects on social and scientific issues.

Participation method depends on the initial level of community activity and capacity in forest related issues

activities will affect the ability of a community to express relevant forest related issues. A comparison of Kitcisakik with Waswanipi demonstrates two communities with different activity levels. In Kitcisakik, although forestry operations significantly affected their traditional territory, the small size of the community, its lack of expertise in resource use and the community's isolation from forestry decision making processes made it difficult for them to voice their concerns. The organisation of the community into institutions which specifically dealt with these issues was not immediately obvious and required years of work with the

community, researchers and forest managers. Participation methods in the early stages could not rely solely on consultation methods because the limited capacity of the community to understand forestry concepts and participate did not guarantee community interests were addressed.

In the other case, in 1998 the Waswanipi community formally filed court injunctions against the federal and provincial governments and forestry companies (Table 2). This community demonstrated a high level of activity on forest related issues with organised and mobilised institutions specifically dealing with these issues. This activity is a reflection of the capacity of the community with respect to individuals and institutions able to respond to imposed forestry practices. It should thus be expected that the participation methods necessary to access the community's reflection should be different between the two communities.

The need for certain participation methods also depends on institutional capacity of the community in relation to forestry issues. Although preoccupation with forestry related issues may be present in all communities, the presence of formal or informal institutions with a mandate to address these issues will differ from one community to the next. This will affect the use of participation methods and the time required to effectively involve the community in the development of C&I. For example, although the community of Kitcisakik maintains traditional patterns of forest resource use, such institutions were not prepared to specifically deal with all forestry related issues. A forestry committee had to be developed as part of the participation methods to develop appropriate C&I. On the other hand, the AFPP was fortunate in that the community already had its own department of natural resources administering forest, fisheries and traditional use programs. This explains why Kitcisakik required much more time and extensive participation efforts to ensure the development of representative C&I.

The need for certain participation methods also depends on institutional capacity of the community in relation to forestry issues

Community contact with researchers and managers who have addressed forest related issues will also influence the use of certain participation methods. The presence of other development efforts in the community and the expertise acquired as a result is an indication of contact. Relative to other Aboriginal communities mentioned in this report, Kitcisakik had limited previous contact with the research community with respect to forestry issues (Table 2). Therefore the methods required to achieve participation from this community were extensive. On one hand the participation methods had to effectively reach the community, as well as introduce and educate the community on forestry related issues. On the other hand participation methods also had to reach industry and government as well as introduce and educate them of aboriginal community issues and functioning.

The differences in community context mentioned here are a few examples demonstrating the effects of context on participation methods. Ideally a combination of methods should be used to accommodate for community attributes such as activity, institutional capacity and contact. Caution therefore needs to be exercised when comparing participation between case studies without differentiating community context.

4.0 Challenges for harmonising C&I and Aboriginal values and objectives

4.1 Conceptual challenges between C&I and Aboriginal values and objectives

Many of the more modern concepts of sustainability and criteria and indicators are foreign ideas to Aboriginal peoples

As a cultural expression of community land ethics, there has been a lot of emphasis on accessing Aboriginal values and objectives for C&I. It is therefore important to approach the conceptual challenges embedded in C&I and Aboriginal cultures in order to clearly identify the limitations of this tool in effectively including Aboriginal interests. The concept of sustainability where economic growth operates where natural resources are maintained for future generations and respects cultural diversity is coherent with Aboriginal cultures and their relationship to the environment (Davidson-Hunt 2006). Although there have been developments concerning Aboriginal participation in forest management, one cannot neglect the fact that many of the more modern concepts of sustainability and criteria and indicators are foreign ideas to Aboriginal peoples. Interpretation of these concepts, especially as it applies to forest management, could therefore run the risk of going against Aboriginal values.

The following are critiques and questions raised by researchers who have used C&I to include Aboriginal forest interests:

- In effect, C&I identify important issues for forest sustainability. Therefore when it comes to including Aboriginal interests, the issue is approached in the same way: important Aboriginal issues for forest sustainability. However, rather than focusing on forest related indicators that have a community dimension, it is suggested that the focus be on the community dimension itself and how forests contribute as a means of sustaining the community (Sherry *et al.* 2005; Beckley *et al.* 2002). More specifically, it should be asked whether the approach offers a nurturing environment for the community.

The inclusion of Aboriginal values and objectives in C&I benefits whom and how?

- C&I is a tool developed for managers. Although public participation and inclusion of Aboriginal interest are sought, and Aboriginal values and objectives are recognised as important, their inclusion in C&I benefits whom and how? More specifically the objectives of C&I in SFM need to be revised to more directly include the objectives of Aboriginal peoples within the national arena to ensure their voice in forestry is heard at the national level. To do so, the role Aboriginal communities should and want to have in forest management needs to be defined. Until Aboriginal goals and their relationship with the land are recognised, Aboriginal values will never truly be included in C&I. Forest

management may thus never achieve social sustainability unless Aboriginal communities achieve the right to live and use their territory as they see fit. According to Colfer *et al.* (2001) although CIFOR developed C&I it was found that no real changes in management were occurring. There was therefore a need to address empowerment and the C&I feedback mechanism. In other words, what mechanisms need to be put in place for indicators to have meaning to a community and be used by that community to achieve change in their forest and its management (Colfer *et al.* 2001)?

- The C&I approach itself may not be conducive to the inclusion of Aboriginal interests. In C&I, forest sustainability issues are reduced and organised into hierarchical formats which have little resemblance to Aboriginal language and modes of expression. Some argue that imposing a management language which requires the conversion of Aboriginal values and objectives, may render Aboriginal ways invisible:

  > adoption of the language, concepts and procedures of environmental resource management (ERM) by aboriginal parties to co-management, whether coerced or not, has served to disarm them in their engagement with the state by inculcating in them: 1) a belief in the rationality, objectivity and superiority of ERM practices, and the western scientific knowledge and economic reasoning that informs them, and 2) a conviction that their own ways of knowing and relating to the 'natural' world are inferior, backward and in need of significant reform (Stevenson 2006).

  Although NAFA and many Aboriginal communities are interested in the criteria and indicator approach to evaluate SFM, C&I processes should not be used as a means of integration. Rather, they should offer the necessary space for the expression of Aboriginal knowledge and management systems.

- Including Aboriginal knowledge and management systems in the compartmental evaluation methods proposed in C&I frameworks can be challenging. Although both groups may be making observations about trends or changes over time, managers like to create units while Aboriginal managers will not necessarily manage specific resources but the relationships to their lands and resources and to each other (Stevenson 2006). A study by Davidson-Hunt and Berkes (2003) demonstrated the important link between society, culture and environment. More specifically, territory (and access to it), environment and land use were shown to be important factors determining community resilience and

identity. Expressing and reducing such a link in C&I may be challenging. However, according to Berkes (2008), Aboriginal knowledge can be described in terms of fuzzy logic:

> a mathematical approach for dealing with complex systems where only approximate information on components and connections are available. It is a way to deal with uncertainty and uses rules of thumb. It is suitable for concepts and systems that do not have sharply defined boundaries, or where the information is incomplete or unreliable.

Berkes (2008) suggested that a useful way of viewing the difference between Aboriginal knowledge and science is that science will seek a small number of indicators which will be specific and provide quantitative results. On the other hand, Aboriginal systems tend to seek to simultaneously use a large number of less specific (and probably multicausal) indicators. C&I, by compartmentalising the effects of forest management, then tend to separate society from nature whereas Aboriginal peoples tend to see society as part of nature. It could thus be argued that in a C&I context, the fuzzy logic approach would be applicable. Evaluating social, economic and environmental sustainability is complex and the boundaries are not sharply defined in reality. However there has been a strong tendency in C&I development to streamline and reduce indicators. This would diminish the role and contribution of Aboriginal knowledge. It would be pertinent to determine whether C&I can indeed provide the space for Aboriginal systems of knowledge and explicitly provide this space.

- It is important to recognise the adaptive efforts required by Aboriginal communities interested in C&I approaches. These efforts can take many forms: financial, technical and language. These efforts need to be matched by facilitating efforts from researchers and managers to ensure their success. Managers should also demonstrate some adaptive efforts to accommodate and include Aboriginal knowledge and management systems. Changes in management systems should result.

It is only by recognising the different sets of values and objectives that conditions for an intercultural dialogue can be established to define foundations for a new forestry which will be better adapted to the Aboriginal context.

Science will seek a small number of indicators which will be specific and provide quantitative results while Aboriginal systems tend to seek to simultaneously use a large number of less specific (and probably multicausal) indicators

4.2   Moving beyond the collection of information

Although participation methods used in the C&I process are used to access community values and objectives, their impact and their success extend beyond the goals of data collection. In effect, participation methods can be used to promote social learning as defined by Argyris and Schon (1978). More specifically, community participation efforts used in the development of C&I can collectively stimulate local interest of all parties in research efforts and the management and monitoring of forest conditions (Colfer *et al.* 2001). This interest can influence communities and forest managers to develop institutions and capacities to promote collaboration. It is in this collaboration that social learning can occur. The use of participatory methods can create the necessary dialogue between different worldviews and knowledge systems. Participatory strategies well anchored in the cultural, historical, economic and political realities of Aboriginal people contribute to define the parameters of a forestry with Aboriginal people (Wyatt 2008; Karjala *et al.* 2004).

According to Argyris and Schon (1978) **social learning** is the beneficial outcome of collaboration which occurs when experiences, ideas and environments are shared between parties (in this case First Nations and forest managers and decision makers) in an approach which involves flexible institutional and organizational arrangements encouraging reflection and innovative responses.

The benefits of social learning are to strengthen socio-environmental systems through the production of flexible, multilevel governance systems in which institutional arrangements and ecological knowledge are tested and revised in an ongoing process (Berkes and Turner 2006). Multilevel governance systems are important because according to Folke *et al.* (2002) many environmental problems are in fact systems problems which cannot be dealt with entirely through science and management. According to these authors the sharing of management power and responsibility between government and local people is necessary.

The notion of resilience therefore emerges where perturbations affecting social and environmental balance can be re-equilibrated through the dynamic dialogue created within multilevel institutions.

The following sections illustrate some of the better examples of the contributions of C&I participatory research to social learning. The process of C&I development has served as a learning vehicle stimulating the capacities of Aboriginal peoples and forest managers to at least partially adapt to an economic, social and ecological environment that is in a state of constant change. However, it will also highlight the need for learning on all sides. More specifically, the participatory methods used in the development of C&I demonstrate the possible collaboration between scientific and community objectives to define the basis for a socially-environmentally adapted forestry. The fact that Aboriginal communities are expected to integrate into a forest management system that originated in an outside culture poses problems. Forest managers (whether government officials or industry) have been involved in learning about Aboriginal values, but there is still criticism of the degree to which they are willing to invest in a continual an on-going processes of social learning regarding the overall impacts of forestry on Aboriginal values instead of focusing on specific issues.

4.2.1 Participatory methods and their contribution to learning

McGregor (2002) demonstrated that research in Aboriginal environments that sought to include communities in all steps of the research and capitalise on the means of sharing information offered better chances of success. Although participation methods may contribute to this success they can also be viewed as a tool to engage, define, collaborate with, empower and educate communities in forest management. Community approaches to the development of C&I can offer the means for Aboriginal expression of their knowledge, practices and belief systems. The C&I process therefore has the necessary tools to use Aboriginal knowledge and values to link forest management with culture, territorial occupation and use, community development, institutions of knowledge and knowledge transmission.

Learning as defined by social learning occurred in Aboriginal communities such as Kitcisakik and AFPP through participatory processes which accompanied, organised and elevated their knowledge such that an appropriate dialogue occurred with forest managers. In Kitcisakik, the participatory methods referred to the model of "education relative to the environment" (ERE) (Saint-Arnaud *et al.* 2005). This approach allowed for the better definition of Kitcisakik's own interpretation of SFM as its primary objective. The use of ERE assisted the community to develop its own reflection of forestry and forest issues which were only then translated into C&I (Sauvé 2003; Sauvé 1997). It helped characterise the Aboriginal/forest/forestry relationship through community and intercommunity dialogue around forestry questions (Saint-Arnaud *et al.* 2005). The representation of such relationships allowed for the development of C&I for SFM that reflected the priorities of Kitcisakik while maintaining community realities pertaining to their culture, values and occupation of the territory.

In AFPP, the notion of "knowledge co-production" was favoured. This included the development of a community-based environmental monitoring method that incorporates the knowledge, needs, beliefs, and concerns of the community through an integrative, flexible framework that applies both indigenous and scientific knowledge (see http://cura.unbc.ca).

Both Kitcisakik and AFPP demonstrate the benefits of participatory methods in the community. While favouring collaboration, the participatory research served as an intervention which assisted the communities in the organisation of their knowledge, critical-analysis of socio-environmental realities and their own interpretation of SFM. The contributions of participatory efforts towards Aboriginal community learning are evident. However, in order for social learning to occur all other stakeholders and interest groups also have to show evidence that critical-analysis of their own definitions are made, and inclusion and use of other knowledge systems are allowed. Power sharing will also make participatory methods have a greater chance of success as people on both side of the table have a vested interested in learning and understanding the other's point of view.

4.2.2 Highlighting the necessary steps towards "true" learning

It is important to note that although community participation efforts can collectively stimulate local interest in research efforts, management and the monitoring of forest conditions, they have also caused some problems in Aboriginal environments. As mentioned by Armitage *et al.* (2008), social learning approaches may have overtones of donor driven agendas due to differences in the power structure of multilevel organisational institutions. Robottom and Sauvé (2003) particularly noted the following as key challenges:

- the sharing of power,

- the role and partnership title of the research,

- the notion of significance,

- the notion of information "dumping", and

- technocratic rationality.

Although the use of participation methods which are culturally adapted to the communities is important, it is also crucial to demonstrate that learning occurs in all participants. To date, evidence that managers are adapting and modifying their thinking, actions and behaviours via the inclusion of the Aboriginal values and objectives is lacking. It has been suggested that efforts towards the sharing of power is the only effective way to resolve these issues and promote true social learning. Armitage *et al.* (2008) for example, stress that attention must be given to learning environments that enable different segments of heterogeneous communities an opportunity to transform traditionally disadvantageous power relations and engage in truly collaborative learning. Although there are benefits for Aboriginal communities in terms of learning, issues of power persist.

In Kitcisakik, when C&I were developed from the different representations expressed through the participatory methods, feelings about changes in the physical environment in terms of changes in elements such as forest cover (more aspen for example) and how these affect wildlife were expressed. There were individual experiences that related to concerns about changes in habitat and wildlife abundance and behaviour on family trap lines but also concerns that these changes are more global. More importantly, it was noted that foresters do not seem to consider the fact that the forest is composed of more than timber or fiber. There was also a deep sorrow and regret at the inability of community members to protect the forest. These concerns further reinforced the issues related to power relations in decision making processes. This reflection helped the community clarify their position on forestry issues and may have educated foresters on the relationship that community members have with their land and how these relationships have been affected by forestry activities. However, the situation in Kitcisakik remains one in which foresters and the government have the ultimate control over the management of traditional lands.

In order for social learning to occur, **all knowledge systems** would ideally need to be elevated to a common level of understanding, power, and respect to ensure appropriate **dialogue**. Knowledge systems need to be allowed the appropriate space in decision making so that they can each individually be influential without necessarily having to merge. This will inevitably call for interdisciplinary and multi-methodological approaches which will also serve to facilitate and promote the capacity of all partners to reach this dialogue and thus social learning. It is important to stress that to date, there seems to be a lot of effort in elevating Aboriginal knowledge systems but in many cases little is done to ensure their role. This was also highlighted by O'Flaherty and Davidson-Hunt (2008) in planning for sustainable forest management with the Pikangikum First Nation and the Whitefeather forest initiative. In some cases a long history of abuses, broken promises and treaties may be important factors leading to a climate of mistrust that will limit the achievement of common understanding.

In the case of Kitcisakik, the interdisciplinary team of researchers and partners, and the multi-strategic participatory methods used allowed for a rich dialogue between the community and interest groups in the territory. The resulting C&I framework was discussed in workshops where key informants were present before any presentation to partners in the forest companies. Although this was important to ensure that collaboration occurred with all partners involved in SFM in the Kitcisakik territory, overtones of a donor agenda remain. Collaboration can become a fuzzy concept between consultation and consensus building. The degree of collaboration needs to be defined as it relates to power relations between parties.

The Innu/government relationship on District 19A in Labrador and the AFPP show promise in defining collaboration initiatives through participatory efforts. In the Innu case study, meetings are held in traditional settings (i.e. tents in the forest with elders at the centre and over multiple days to ensure time for reflection) and all agreements must be endorsed by both groups. In the case of AFPP, capacity building as a result of co-management efforts has been discussed by Grainger *et al.* (2006). The authors noted the efforts to further employ and strengthen local management institutions. Acknowledgement of traditional rights, and providing positions on the Board of Directors provided the opportunity for participation in land management planning as well as attempting to incorporate traditional land stewardship elements into the project. Also issues regarding funding, effective facilitation, administrative and external support are components which are considered important to promote the capacity required to support co-management efforts. The authors noted that:

> structures were in place to promote power-sharing, establish co-operation and equity, promote in-depth communication, build respect and trust among very different but legally-bound parties, and explicate the practical, everyday challenges encountered by resource users and managers (Grainger *et al.* 2006).

Organizing the territory and its local institutions as well as better incorporation of Aboriginal forest issues in the management of the territory should not be seen as an ultimate goal but as an important step towards true sharing of decision making

and true harmonisation. Defining power relations and the role of each knowledge system in management decisions is crucial to ensure social learning away from the "donor and dumping" agenda cautioned by Robottom and Sauvé (2003). In the efforts made for capacity building, collaboration and learning all participating parties and <u>all</u> knowledge systems need to be involved. Each has a responsibility to teach and learn and therefore participation methods need to ensure that all parties engage in social learning.

5.0 Key issues in the implementation of Aboriginal C&I

5.1 The effects of understanding and methods used to access Aboriginal values and goals

This report has highlighted some of the difficulties which have been met following attempts to include Aboriginal values and objectives into the C&I process. It is important to note that C&I have been successful in providing a platform to discuss scientific and social values pertaining to sustainability issues between non-Aboriginal and Aboriginal cultures. Despite a compartmentalised approach to indicator development there is an underlying thrust to capture multiple Aboriginal factors important to forest sustainability. However, current approaches do not focus on linkages between/among different indicators or criteria, despite the fact that many indicators could fit into multiple criteria. Instead of stressing the uniqueness of indicators, C&I processes would better represent Aboriginal values and objectives if they were to stress linkages and the fuzzy logic which best describes Aboriginal knowledge and management systems. It is thus pertinent to attempt to determine the implications of these challenges on the application of C&I frameworks.

Initially in this report, it was asked whether the persistent feeling of lack of commitment from managers was due to a lack of understanding of Aboriginal values and objectives, or the methods used to access them. In terms of understanding Aboriginal values and objectives as expressed by C&I frameworks, it was found that non-Aboriginal approaches to compartmentalising versus Aboriginal perspectives have more overlap in indicators than one may expect. In effect, most of the non-Aboriginal C&I frameworks could be viewed as not inconsistent with Aboriginal values and objectives. So why bother isolating and investing so much effort in Aboriginal values and objectives in SFM? One may initially think that if 75% of Aboriginal indicators are captured in C&I processes, this may be a sufficient compromise. However, if C&I are to be holistic, it could be argued that a system without 25% of its components may not be functional. The whole is more important than its component parts.

Most of the non-Aboriginal C&I frameworks analysed could be viewed as not inconsistent with Aboriginal values and objectives

Further analysis of the differences between Aboriginal and non-Aboriginal frameworks showed a consistent oversight of culturally defined means of expressing Aboriginal knowledge and management systems. More specifically, society and nature are treated separately. It is important to recognise that forestry is occurring on lands on which Aboriginal communities live and have lived for generations. Changes caused by forestry thus have many cultural implications. Linkages have to be made with ecological indicators and their effects on, or relationship to, cultural values. Attention to such factors is critical to the application of C&I frameworks because if the system is to achieve a sense of holism and sustainability for all, it cannot persistently ignore the cultural differences between Aboriginal and non-Aboriginal knowledge and management systems.

Within many C&I processes, the general understanding of Aboriginal needs and values exists in some form or another. However, when processes seek to be holistic they should aim for a stronger understanding of their differences. It should be remembered that values and goals, including those of Aboriginal communities, are dynamic and in constant evolution. Although many factors are changing, Aboriginal relationships to the land, their ties and traditions are an integral part of their cultures. Forest management is not the only change that these communities must contend with, even if it has immediate effects on their relationship with the land. This implies that continuous and constant revisions will always need to be made with communities to ensure that C&I are (1) consistent with their realities and (2) indeed representative of their values and needs.

A review of the methods used to access Aboriginal values and objectives has shown that although the objectives of C&I development are for the evaluation and monitoring of forests for SFM, their impacts far exceed these objectives in Aboriginal communities. The C&I process can be used to include, educate, engage, and empower Aboriginal communities in forest management. In Aboriginal communities, the C&I process can also be used to define a forestry which is more adapted to their cultural context. As such, different approaches to the development of C&I should be used depending on C&I objectives, capacity and community context.

It is mostly the participatory methods used which determine the level of inclusion, engagement, education and empowerment which is left in the communities. Until Aboriginal communities have reached an acceptable level of empowerment in forest management, much effort and time will need to be invested to assist these communities in the development of C&I and educate managers in the definition of sustainability that encompasses community values.

The significance of choosing between top-down versus bottom-up process does not seem to be the key issue to the successful inclusion of Aboriginal values and goals. A hybrid of the two processes will permit the development of C&I where national issues will merge more organically with locally important issues. However, accessing local issues will always require effective participatory methods to engage the communities in the process and ensure that all issues are appropriately addressed. It is therefore the use of effective participatory methods which ensures the accurate expression of local issues.

5.2   The effects of conceptual challenges between C&I and Aboriginal values and objectives

This report asked whether the process of C&I was appropriate to Aboriginal communities. For the process to be successful, managers must embrace the different sets of values and objectives, and include them in forest management. Managers must learn from and use Aboriginal realities to manage forests, but not without the meaningful participation and engagement of Aboriginal peoples. Therefore C&I objectives in Aboriginal communities extend beyond that of merely identifying C&I for SFM. This could result in a new forestry, a culturally adapted forestry, an Aboriginal forestry. This notion has many implications for the use and implementation of C&I frameworks by managers. The necessary groundwork needs to be completed to ensure capacity in communities for participation in all dialogues related to forestry. Education of community members and of forest managers can increase feelings of empowerment, hope and purpose. Increased understanding and application of Aboriginal values and objectives should be included in forest management and thus expand the pool of knowledge. These changes can create the necessary ingredients for social learning and its associated benefits.

The recognition and accommodation of different sets of values and objectives is important to ensure that SFM will achieve the goals of both managers and Aboriginal communities. This requires collaboration and dialogue between the members holding these different forest perspectives. In order to collaborate, the role of Aboriginal communities needs to be defined, first by them, and then in collaboration. The community also needs to be engaged and involved in the process. Methods used for the development of C&I therefore need to capitalise on mutual learning, participation and education. As shown in this report, appropriate participation methods need to be determined based on a clear understanding of the community context. However, collaboration has to occur with all parties if it is to be effective. Therefore managers need to demonstrate: an honest and transparent interest in the community; an honest effort to learn from the community; willingness to participate in community education; and share power through various approaches and institutions.

Managers need to demonstrate interest in the community; an effort to learn from the community; willingness to participate in community education; and share power through various approaches and institutions

An effective platform is necessary to allow for the expression of different sets of values and objectives in forest management. C&I has the potential to become this platform of discussion. However, considering the foreign concepts related to C&I methods, it is important to recognise the adaptive efforts required by Aboriginal communities interested in such approaches. After all, the C&I concepts, language and approaches were developed for managers. Aboriginal efforts to maximize the benefits of C&I processes therefore need to be matched by facilitating efforts from researchers and managers to ensure their success. Participatory methods which emphasize education and empowerment will allow community capacity development. In order for C&I to be successfully implemented in the interests of sustainability, it will require the long term investment and collaboration of both

forest managers and Aboriginal communities. C&I processes also have to offer the opportunity and flexibility to learn from and adapt to Aboriginal values and objectives. Only when C&I truly meet and include the differences found in Aboriginal values and goals for their lands, will this tool be appropriate for Aboriginal communities.

References

Adam, M.C., and Kneeshaw, D.D. 2008. Local level criteria and indicator frameworks: A tool used to assess Aboriginal forest ecosystem values. Forest Ecology and Management 255: 2024-2037.

Argyris, C. and Schon, D. 1978. Organizational learning: A theory of action perspective. Addison-Wesley, Reading, MA.

Armitage, D., Marschke, M., and Plummer, R. 2008. Adaptive co-management and the paradox of learning. Global environmental Change 18: 86-98.

Beckley, T.M. 2000. Sustainability for whom: Social indicators for forest-dependent communities in Canada. Sustainable Forest Management Network project report 2000-34.

Beckley, T.M., Parkins, J., and Stedman, R. 2002. Indicators of forest-dependent community sustainability: The evolution of research. Forestry Chronicle 78(5): 626-636.

Berkes, F. 2008 *Sacred Ecology. second ed.* Routledge, New York.

Berkes, F. and Berkes, M.K. 2008. Ecological complexity, fuzzy logic, and holism in indigenous knowledge. Futures 41:6-12.

Berkes, F. and Turner, N.J. 2006. Knowledge, learning and the evolution of conservation practice for socio-ecological system resilience. Human ecology 34(4): 479-494.

Bunnell, F.L., and Huggard, D.J. 1999. Biodiversity across spatial and temporal scales: Problems and opportunities. Forest Ecology and Management 115(2-3): 113-126.

Canadian Council of Forest Ministers. 2003. Defining sustainable forest management in Canada: criteria and indicator 2003. http://www.ccmf.org/ci/CI_Booklet_e.pdf

Canadian Council of Forest Ministers (CCFM). 1995. Defining sustainable forest management: a Canadian approach to criteria and indicators. Canadian Council of Forest Ministers, Ottawa, Canada. URL: http:// www.ccfm.org/ci/framain_e.html.

Canadian Model Forest Network (CMFN). 2000. User's Guide to Local Level Indicators of Sustainable Forest Management. Natural Resources Canada, Ottawa.

Castañeda, F. 2000. Criteria and indicators for sustainable forest management: International processes, current status and the way ahead. Unasylva 51(203): 34-40.

Cheveau, M., Imbeau, L., Drapeau, P., and Bélanger, L. 2008. Current status and future directions of traditional ecological knowledge in forest management: a review. Forestry Chronicle 84(2): 231-243.

Colfer, C.J.P., Salim, A., Tiani, A.M., Tchikangwa, B., Sardjono, M.A., and Prabhu, R. 2001.Whose forest is this, anyway? *Criteria and Indicators of Sustainable Forest Management.* Raison R.J., Brown A.G., and Flinn D.W. (Eds), CAB International in Association with the International Union of Forestry Research Organizations (IUFRO), New York.

Côte, M.A., and Bouthillier, L. 2002. Assessing the effect of public involvement processes in forest management in Quebec. Forest Policy and Economics 4(3): 213-225.

Davidson-Hunt, I.J. 2006. Adaptive learning networks: Developing resource management knowledge through social learning forums. Human Ecology 34 (4): 593-614.

Davidson-Hunt, I., and Berkes, F. 2003. Learning as you journey: Anishinaabe perception of social-ecological environments and adaptive learning. Ecology and Society 8(1).

Ettenger, K., and elders, hunters, tallymen. 2002. Muskuuchii: Protecting a Traditional Iyiyuuch Wildlife Preserve and Sacred Site.

Folke, C., Carpenter, S., and Elmqvist, T. 2002. Resilience for sustainable development: building adaptive capacity in a world of transformations. International council for scientific unions (ICSU). Rainbow Series No. 3, Paris. (http://www.sou.gov.se/mvb/pdf/resiliens.pdf).

Forest Stewardship Council (FSC) Canada Working Group. 2004. National Boreal Standard. Forest Stewardship Council, Toronto, Canada. (http://www.fsccanada.org/pdf_document/BorealStandard_Aug04.pdf).

Fraser, E.D.G., Dougill, A.J., Mabee, W.E., Reed, M., and McAlpine, P. 2006. Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. Journal of Environmental Management 78(2): 114-127.

Gladu, J.P., and Watkinson, C. 2004. Measuring sustainable forest management: a compilation of Aboriginal indicators. A report for the Canadian Model Forest Network – Aboriginal strategic initiative (draft).

Grainger, S., Sherry, E.E., and Fondahl, G. 2006. The John Prince Research Forest: Evolution of a co-management partnership in northern British Columbia. Forestry Chronicle 82 (4): 484-495.

Hickey, C.G. et Nelson, M. 2005. Partenariat entre les premières nations et le secteur forestier : une enquête national. Réseau de gestion durable des forêts, Edmonton (Alberta). 34p.

Holvoet, B., and Muys, B. 2004. Sustainable forest management worldwide: A comparative assessment of standards. International Forestry Review 6(2): 99-122.

Innes, J.L., Wilson, B., and Hickey, G.M. 2004. Streamlining planning and reporting for sustainable forest management. International Perspectives on Streamlining Local-level Information for Sustainable Forest Management: 105-109.

Karjala, M.K., and Dewhurst, S.M. 2003. Including Aboriginal issues in forest planning: A case study in central interior British Columbia, Canada. Landscape and Urban Planning 64(1-2): 1-17.

Karjala, M.K., Sherry, E.E., and Dewhurst, S.M. 2004. Criteria and indicators for sustainable forest planning: A framework for recording Aboriginal resource and social values. Forest Policy and Economics 6 (2): 95-110.

Kneeshaw, D.D., Leduc, A., Drapeau, P., Gauthier, S., Pare´, D., Carignan, R., Doucet, R., Bouthillier, L., and Messier, C. 2000. Development of integrated ecological standards of sustainable forest management at an operational scale. Forestry Chronicle 76 (3), 481–493.

McDonald, G.T. and Lane, M.B. 2004. Converging global indicators for sustainable forest management. Forest Policy and Economics 6(1): 63-70.

McGregor, D. 2002. Indigenous knowledge in sustainable forest management: Community-based approaches achieve greater success. Forestry Chronicle 78 (6) : 833-836.

Natcher, D.C. 2001. Land use research and the duty to consult: A misrepresentation of the Aboriginal landscape. Land Use Policy 18(2): 113-122.

Natcher, D.C., and Hickey, C.G. 2002. Putting the community back into community-based resource management: A criteria and indicators approach to sustainability. Human Organization 61(4): 350-363.

Natcher, D.C., Davis, S., and Hickey, C.G. 2005. Co-management: managing relationships, not resources. Human Organization 64(3): 240-250.

National Forest Strategy Coalition (NFTC). 2003. National Forest Strategy (2003-2008), A Sustainable Forest: The Canadian Commitment. (http://www.nafaforestry.org/docs/strategy2003.pdf)

Natural Resources Canada. 2002. Waswanipi Cree Model forest – phase II: evaluation report. (http://www2.nrcan.gc.ca/dmo/aeb/).

Neimann, T. and Innes, J. 2004. Streamlining local-level information for sustainable forest management. International perspectives on streamlining local-level information on sustainable forest management: 1-16.

O'Flaherty, R.M., Davidson-Hunt, I.J., and Manseau, M. 2008. Indigenous knowledge and values in planning for sustainable forestry: Pikangikum First Nation and the Whitefeather forest initiative. Ecology and Society 13(1): 6.

Parrotta, J.A., and Agnoletti, M. 2007. Traditional forest knowledge: Challenges and opportunities. Forest Ecology and Management 249(1-2): 1-4.

Robinson, M.P. and Ross, M.M. 1997. Traditional land use and occupancy studies and their impact on forest planning and management in Alberta. Forestry chronicle 73(5): 596-605.

Robottom, I and Sauvé, L. 2003. Reflecting on Participatory Research in Environmental Education: Some Issues for Methodology. Canadian Journal of Environmental Education, 8: 111-128.

Ross, M.M. and Smith, P. 2002. Accomodation of Aboriginal rights: the need for an Aboriginal forest tenure. Sustainable Forest Management Network, Alberta.

Saint-Arnaud, M. 2009. Contribution à la définition d'une foresterie autochtone : le cas des Anicinapek de Kitcisakik. PhD thesis, University of Quebec in Montreal, Montreal, Quebec, Canada.

Saint-Arnaud, M; Sauvé. L. et Kneeshaw, D. 2005. Forêt identitaire, forêt partagée : trajectoire d'une recherche participatice chez les Anicinapek de Kitcisakik (Québec, Canada). Vertigo 6(2).

Sauvé, L. 1997. Pour une éducation relative à l'environnement – Éléments de design pédagogique, Guide de développement professionnel à l'intention des éducateurs, Montréal: Guérin – Eska, 2e édition, 361 p. Première édition: 1994.

Sauvé, L. et Brunelle, R. 2003. Environnements, cultures et développements. Éducation relative à l'environnement – Regards, Recherches, Réflexions, 4, 378 p.

Sherry, E., Halseth, R., Fondahl, G., Karjala, M., and Leon, B. 2005. Local-level criteria and indicators: An Aboriginal perspective on sustainable forest management. Forestry 78(5): 513-539.

Smith, P. 2004. Inclusion before streamlining: the status of data collection on Aboriginal issues for sustainable forest management in Canada. International Perspectives on Streamlining Local-level Information for Sustainable Forest Management: 94-104.

Smith, P. 1998. Aboriginal and treaty rights and Aboriginal participation: Essential elements of sustainable forest management. Forestry Chronicle 74(3): 327-333.

Stevenson, M.G. 2006. The Possibility of Difference: Rethinking Co-management. Human Organization; Summer 2006; 65.

Stevenson, M. and Webb, J. 2003. Just another stakeholder? First Nations and sustainable forest management in Canada's boreal forest. *In* Towards sustainable management of boreal forest. *Edited by* PJ Burton, C. Messier, D.W. Smith, and W.L. Adamowicz. NRC Research Press, Ottawa, Ontario, Canada. Pp 65-112.

Woodley, S., Alward, G., Iglesias Gutierrez, L., Hoekstra, T., Holt, B., Livingston, L., Loo, J., Skibicki, A.,Williams, C., and Wright, P., 1999. North America Test of Criteria and Indicators of Sustainable Forestry. USDA Forest Service: Inventory and Monitoring Institute.

Wright, P.A., Alward, G., Colby, J.L., Hoeskstra, T.W., Tegler, B., and Turner, M. 2002. Monitoring for forest management unit scale sustainability: the local unit criteria and indicators development (LUCID) test (Management edition). Fort Collins, CO: USDA Forest Service Inventory and Monitoring Report No. 5 54.

Wyatt, S. 2008. First Nations, Forest lands and "Aboriginal forestry" in Canada: from exclusion to co-management and beyond. Canadian Journal of Forest Research 38(2): 171-180.

Yamasaki, S.H., Côté, M.A., Kneeshaw, D.D., Fortin, M.J., Fall, A., Messier, C., Bouthillier, L., Leduc, A., Drapeau, P., Gauthier, S., Paré, D., Greene, D., and Carignan, R. 2001. Integration of ecological knowledge, landscape modelling, and public participation for the development of sustainable forest management. SFM Network project report 2001-27.

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